



MI6

User's Manual



Version 1.0

Copyright

All rights reserved. Permission to reprint or electronically reproduce any document or graphic in whole or in part for any reason is expressly prohibited, unless prior written consent is obtained from the DirectOut GmbH.

All trademarks and registered trademarks belong to their respective owners. It cannot be guaranteed that all product names, products, trademarks, requisitions, regulations, guidelines, specifications and norms are free from trade mark rights of third parties.

All entries in this document have been thoroughly checked; however no guarantee for correctness can be given.

DirectOut GmbH cannot be held responsible for any misleading or incorrect information provided throughout this manual.

DirectOut GmbH reserves the right to change specifications at any time without notice.

DirectOut Technologies® is a registered trademark of the DirectOut GmbH.

© DirectOut GmbH, 2015

Table of contents

About This Manual	5
How to Use This Manual.....	5
Conventions	5
CHAPTER 1: Overview	6
Introduction	6
Feature Summary.....	6
How it works	6
Applications.....	7
CHAPTER 2: Legal issues & facts	8
Before Installing This Device	8
Defective Parts/Modules	8
First Aid (in case of electric shock).....	9
Updates	10
Conditions of Warranty	10
Intended Operation	10
Conformity & Certificates	11
Contact.....	11
Contents.....	12
Accessory.....	12
CHAPTER 3: Installation	14
Installing the Device	14
CHAPTER 4: Operation	18
Global Control.....	18
Introduction	18
Input Selection	19
Sync.....	19
Monitoring Mode (Mono / Stereo).....	20
Key Lock.....	20
Mixing	21
Isolate.....	22
Speaker Off	23
Monitoring.....	24
Signal Input / Output	25
Servicing.....	26
CHAPTER 5: Troubleshooting and Maintenance	27
Troubleshooting	27
Maintenance.....	27
CHAPTER 6: Technical Data	28

Appendix A: Wiring AES I/O, Line Out	30
DSUB-9 (female)	30
Index	31

About This Manual

How to Use This Manual

This manual guides you through the installation and operation of the device. Use the Table of Contents at the beginning of the manual or Index Directory at the end of the document to locate help on a particular topic. You can access more information and latest news by visiting on the DirectOut website at www.directout.eu.

Conventions

The following symbols are used to draw your attention to:

TIPS!

indicate useful tips and shortcuts.



NOTES!

are used for important points of clarification or cross references.



WARNINGS!

alert you when an action should always be observed.



CHAPTER 1: Overview

Introduction

MI6 is DirectOut's monitoring device for signal control in MADI environments. MI6 provides three MADI inputs and outputs, an analog stereo line out and an AES I/O. Up to 8 stereo or 16 mono channels can be summed with individual levels onto a main mix. The main mix is output by the integrated speakers and the other outputs.



Feature Summary

MADI Ports	1 x SC multi-mode connectors 1 x SFP (empty cage without module) 1 x coaxial BNC connectors with PFT technology (power fail through)
MADI Formats	56/64 channel, 48k/96k Frame
Sample Rates	44.1, 48, 88.2, 96 kHz +/-12.5%
AES Port	1 x AES3 I/O (DSUB-9)
Line Output	1 x stereo, balanced, +24 dBu (DSUB-9)
Speaker	2 x speakers
Headphone Output	6.3 mm TRS jack, stereo, +18 dBu
USB Port	USB 2.0 port for firmware updates
Power Supply	This device is equipped with one wide range power supply (84 V to 264 V AC / 47 Hz to 63 Hz / safety class 1).

How it works

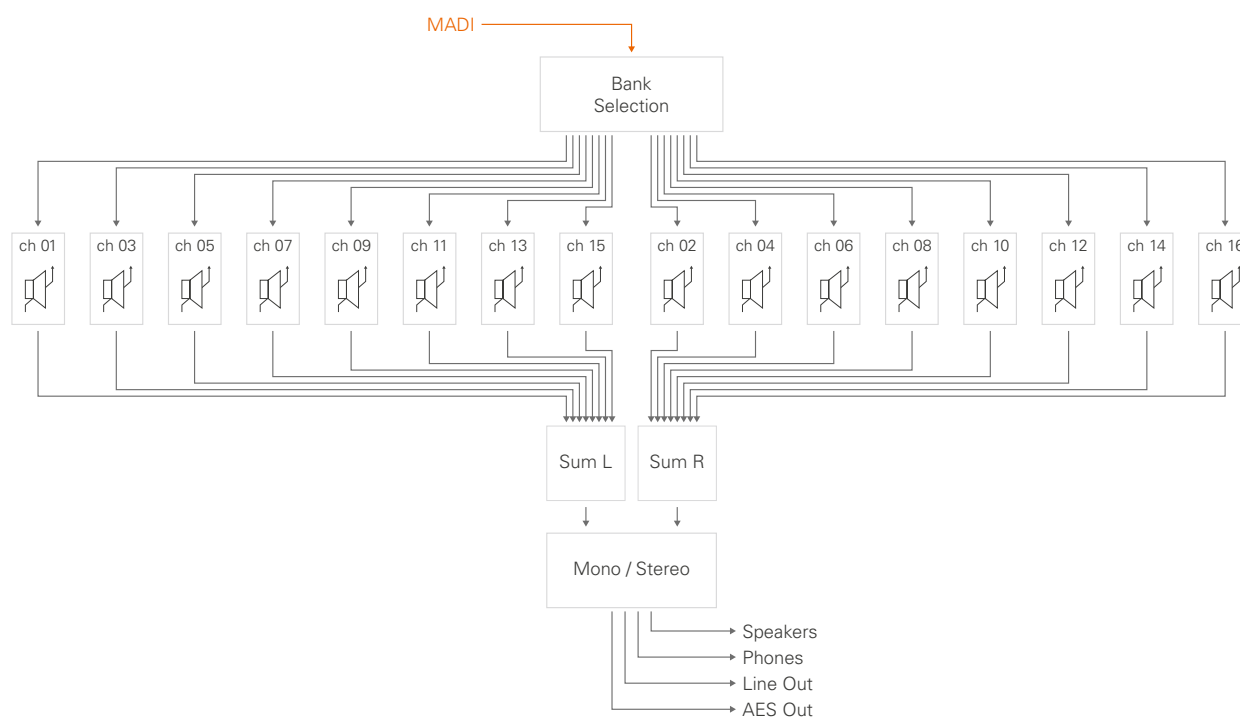
A bank of 16 audio channels is selected from the MADI input signal. Each of the 16 audio channels is added to the mix bus with variable volume control and mute function. The monitoring can be either 'STEREO' (odd channels to left side / even channels to right side) or 'MONO' (all channels to both sides). Mutes are stored separately with each input bank, i. e. there are 64 independent mutes. An 'ISOLATE' function mutes all 16 channels for soloing single or several channels. The speakers can be muted individually from the other outputs ('SPEAKER OFF').

Applications

MI6 can be used for monitoring, line checking and mixing of digital signals.

Typical applications include:

- creation of individual monitor feeds for commentators
- flexible signal control of a MADI signal
- basic mix of 8 stereo or 16 mono channels
- ...



CHAPTER 2: Legal issues & facts

Before Installing This Device



WARNING!

Please read and observe all of the following notes before installing this product:

- Check the hardware device for transport damage.
- Any devices showing signs of mechanical damage or damage from the spillage of liquids must not be connected to the mains supply, or disconnected from the mains immediately by pulling out the power lead.
- All devices must be grounded. The device is grounded through its IEC power connections.
- All devices must be connected to the mains using the three-cord power leads supplied with the system. Only supply electrical interfaces with the voltages and signals described in these instructions.
- Do not use the device at extreme temperatures. Proper operation can only be guaranteed between temperatures of 5° C and 45° C and a maximum relative humidity of 80 %, non-condensing.
- The cabinet of the device will heat up. Do not place the device close to heating sources (e.g. heaters). Observe the environmental conditions.

Defective Parts/Modules



WARNING!

This device contains no user-serviceable parts. Therefore do not open the device. In the event of a hardware defect, please send the device to your DirectOut representative together with a detailed description of the fault.

We would like to remind you to please check carefully whether the failure is caused by erroneous configuration, operation or connection before sending parts for repair.

First Aid (in case of electric shock)

WARNING!



- Do not touch the person or his/her clothing before power is turned off, otherwise you risk sustaining an electric shock yourself.
- Separate the person as quickly as possible from the electric power source as follows:
 - Switch off the equipment.
 - Unplug or disconnect the mains cable.
- Move the person away from the power source by using dry insulating material (such as wood or plastic).
- If the person is unconscious:
 - Check their pulse and reanimate if their respiration is poor.
 - Lay the body down and turn it to one side. Call for a doctor immediately.
- Having sustained an electric shock, Always consult a doctor.

Updates

DirectOut products are continually in development, and therefore the information in this manual may be superseded by new releases. To access the latest documentation, please visit the DirectOut website:

www.directout.eu.

This guide refers to firmware version 1.3.

Intended Operation

The MI6 is designed for monitoring and mixing of digital audio signals. In this context digital audio refers to a MADI signal (AES10).



WARNING!

No compensation can be claimed for damages caused by operation of this unit other than for the intended use described above. Consecutive damages are also excluded explicitly. The general terms and conditions of business of DirectOut GmbH are applied.

Conditions of Warranty

This unit has been designed and examined carefully by the manufacturer and complies with actual norms and directives.

Warranty is granted by DirectOut GmbH over the period of two years for all components that are essential for proper and intended operation of the device. The date of purchase is applied for this period.

Consumable parts (e.g. battery) are excluded from warranty claims.



WARNING!

All claims of warranty will expire once the device has been opened or modified, or if instructions and warnings were ignored.

For warranty claims please contact the dealer where your device was acquired.

Conformity & Certificates

CE

This device complies with the basic requests of applicable EU guidelines. The appropriate procedure for approval has been carried out.

RoHS

(Restriction of the use of certain Hazardous Substances)

This device was constructed fulfilling the directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment 2002/95/EC.

WEEE

(Directive on Waste Electrical and Electronic Equipment)

Due to the directive 2002/96/EC for waste disposal this device must be recycled.

For correct recycling please dispatch the device to:

IMM Elektronik GmbH,

Leipziger Str. 32

09648 Mittweida

Germany

Only stamped parcels will be accepted!

WEEE-Reg.-No. DE 93924963

Contact

Sales:

DirectOut GmbH, Leipziger Str. 32, 09648 Mittweida, Germany

Phone: +49 (0)3727 99697-50 // Fax: +49 (0)3727 99697-52

www.directout.eu

Manufacturer:

IMM Elektronik GmbH, Leipziger Str. 32, 09648 Mittweida, Germany

Phone: +49 (0)3727 6205-0 // Fax: +49 (0)3727 6205-56

www.imm-gruppe.de

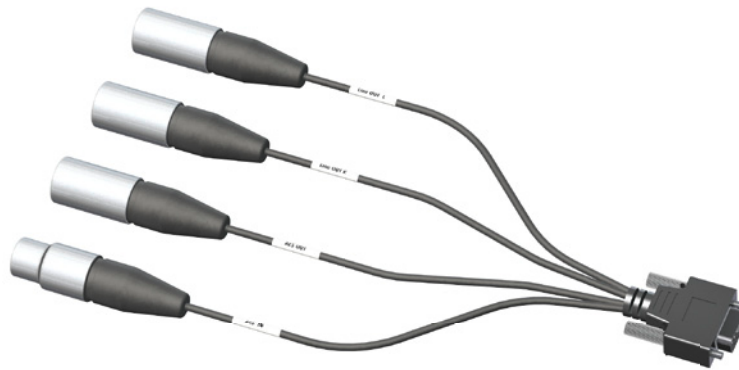
Contents

The contents of your MI6 package should include:

- 1 x MI6 (19", 1 RU)
- 1 x power chord
- 1 x fixing unit for power plug
- 1 x Manual

Accessory

The Line Out and AES3 I/O are available as a DSUB-9 socket. For adaption between DSUB-9 and XLR plugs an adaptor is offered optionally.



DSUB-9 to XLR adaptor

Signal	XLR
Line Out L	female
Line Out R	female
AES3 input	male
AES3 output	male

Pinout DSUB-9: see „Appendix A: Wiring AES I/O, Line Out“ on page 30.

Two different optical SFP modules are available from DirectOut GmbH:

- Multimode SFP transceiver with LC connectors (No: 11900-129)
- Singlemode SFP transceiver with LC connectors (No: 11900-130)

Specification of the optical SFP modules:

SFP	Multimode	Singlemode
Wavelength TX	1310 nm	1310 nm
Wavelength RX	1310 nm	1310 nm
Distance	2 km	10 km
Powerbudget (dB)	11 dB	12 dB
Protocols	Fast Ethernet OC3/STM1	Gigabit Ethernet, Gigabit Fibre Channel
Bandwidth from	100 Mbit/s	1.050 Gbit/s
Bandwidth	155 Mbit/s	1.250 Gbit/s
Laser	FP	FP
Receiver Type	PIN	PIN
Connector	LC	LC
Wavelength TX min	1260 nm	1260 nm
Wavelength TX max	1360 nm	1360 nm
Wavelength RX min	1260 nm	1260 nm
Wavelength RX max	1620 nm	1600 nm
Transmit min	- 19.00 dBm	- 9.00 dBm
Transmit max	- 14.00 dBm	- 3.00 dBm
Receive min	- 30 dBm	- 21.00 dBm
Receive max (Receiver overload)	- 5.00 dBm	- 3.00 dBm
Temperature (min)	0° Celsius	0° Celsius
Temperature (max)	70° Celsius	70° Celsius
Type of DDM/DOM	internal	internal
Extinction Ratio	8.20 dB	9 dB

CHAPTER 3: Installation

Installing the Device

1. Open the packaging and check that the contents have been delivered complete and undamaged.
2. Fix the device in a 19" frame with four screws, or place it on a non-slip horizontal surface.



WARNING!

Avoid damage from condensation by waiting for the device to adapt to the environmental temperature. Proper operation can only be guaranteed between temperatures of 5° C and 45° C and a maximum relative humidity of 80%, non-condensing. Ensure that the unit has sufficient air circulation for cooling.

3. Remove the protective cap from the optical MADI port(s) before use.



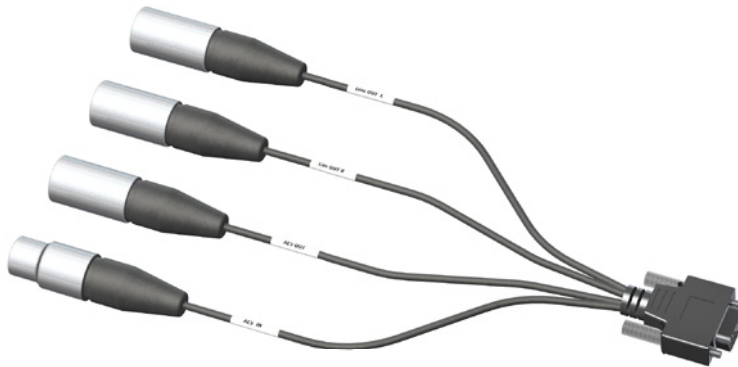
NOTE!

Retain the protective cap if the optical port is unused. This will protect against soiling which can lead to malfunction.

4. Connect signal cable(s) for the MADI signals.



5. Connect the signal cables for the analog and AES3 audio signals to the DSUB-9 adaptor. Connect the adaptor to the DSUB-9 plug at the rear panel.



The adaptor converts from DSUB-9 (male) to:

- 2 x XLR male (Line Out L/R)
- 1 x XLR male (AES3 output)
- 1 x XLR female (AES3 input).



WARNING!



Do not connect voltage sources to the analog outputs. This may cause damage at the output stages. Observe the technical specifications listed in this document.

6. Optional: Connect a USB cable to the USB port for firmware updates. This requires the USB Serial driver (Windows) being installed first. The driver and the installation instructions are available at www.directout.eu.

- 7.** Using the power cord provided connect the PSU to a matching power supply:



WARNING!

This device must be connected to the mains using the three-cord power leads supplied with the system. Only supply the voltages and signals indicated (84 V – 264 V).

- 8.** Turn on the power switch:



While the device is booting the currently installed firmware version is indicated by signal leds in the upper and lower row - e.g. firmware version 1.3



TIP!

Use the DirectOut Release Map to match your DirectOut device with the latest firmware or software release.

Link: http://www.directout.eu/upload/dokumente/dotec_release_map.pdf



NOTE!

To update the firmware an installed USB serial driver (Windows) and the Update Tool are necessary. The software and the installation instructions are available at www.directout.eu.

TIP!



Keep any packaging in order to protect the device should it need to be dispatched for service.

9. Installation of USB Serial driver

- download the USB Serial driver
- download the 'Installation Guide for USB Control'
 - Link: <http://www.directout.eu>
- follow the installation instructions in the 'Installation Guide for USB Control'

CHAPTER 4: Operation

Introduction

This chapter describes the basic operation of the device.

Note that throughout this manual, the abbreviation FS refers to sample rate or sample frequency. So, when dealing with scaling factors, the following sample rates can be written as:

- 44.1 kHz or 48 kHz = 1 FS
- 88.2 kHz or 96 kHz = 2 FS
- 176.4 kHz or 192 kHz = 4 FS

Global Control

The power switch is on the back panel:



Power	1 Switch Enable / disable power supply.
Power	C13 socket Connect the power supply here (84- 264 V AC).



NOTE!

Unlit leds at the front panel do not guarantee that the device is free of voltage. To ensure that the device is completely disconnected from mains voltage, the power chords must be disconnected.

Sync

The MAD1 input is used as sync source for the device.



SYNC	LED (green) - indicates the lock / sync state of the device <div><input type="radio"/> (OFF) - no input signal detected <input checked="" type="radio"/> (ON) - valid input signal detected</div>
-------------	---

The channel mode (56ch <-> 64ch) is detected automatically.
All MAD1 outputs carry the signal of the active MAD1 input.
The device will switch to 2 FS operation automatically when a 96k Frame signal has been detected.

Input Selection

One of the three MAD1 inputs is used as general input source.
Selection priority of locked inputs: BNC > SC > SFP



The active MAD1 input signal is divided into four banks four banks with 16 channels each. The bank is selected by pressing the push button (loop selection).

LED 'INPUT' <1..> / <17..> / <33..> / <49..>	4 LEDs (green) - indicate the bank selection of the MAD1 signal. <div><div><input checked="" type="radio"/></div><div><input type="radio"/></div><div><input type="radio"/></div><div><input type="radio"/></div>channel 01 .. 16 selected <div><input type="radio"/></div><div><input checked="" type="radio"/></div><div><input type="radio"/></div><div><input type="radio"/></div>channel 17 .. 32 selected <div><input type="radio"/></div><div><input type="radio"/></div><div><input checked="" type="radio"/></div><div><input type="radio"/></div>channel 33 .. 48 selected <div><input type="radio"/></div><div><input type="radio"/></div><div><input type="radio"/></div><div><input checked="" type="radio"/></div>channel 49 .. 64 selected</div>
'INPUT' <1..> / <17..> / <33..> / <49..>	Push button - bank selection of the MAD1 signal. Press to cycle the bank selection. Press and hold > 2 s to override key lock.

Monitoring Mode (Mono / Stereo)

The channel routing to the mix bus provides two options: MONO and STEREO. The mode is toggled by pressing the push button.



STEREO	LED (green) - indicates the monitoring mode. <ul style="list-style-type: none"> ○ (OFF) - odd and even channels are routed to both sides (left & right) ● (ON) - odd channels are routed to left (L) even channels are routed to right (R)
STEREO	Push button - toggles the monitoring mode. Press to toggle between STEREO and MONO. Press and hold > 2 s to override key lock.

Key Lock

The bank selection and mono/stereo selection can be locked to prevent accidental changes.



To enable key lock:

- switch device on
- while the firmware version is displayed, press either push button 'INPUT' or 'STEREO' to toggle key lock.

Code	Meaning	LED Code
● ● ● ●	key lock inactive	all 'BANK' leds ON
○ ○ ○ ○	key lock active	all 'BANK' leds OFF

To override active key lock temporarily:

- press the push button ('INPUT' or 'STEREO') > 2 s
- the corresponding led(s) will start blinking
- press the push button short to change the selection

Mixing

The volume of the 16 audio channels in the mix is adjusted by 16 potentiometers. Each channel can be muted in the mix individually by pressing the particular push button.



SIG channel '1' to channel '16'	LED (green) - indicates the signal level of the particular audio channel. <input type="radio"/> (OFF) - signal level <- 80 dBFS <input checked="" type="radio"/> (ON) - signal level >- 80 dBFS The light intensity of the leds depends on the audio level.
MUTE channel '1' to channel '16'	LED (red) - indicates the mute state of the particular audio channel. <input type="radio"/> (OFF) - channel mute ON <input checked="" type="radio"/> (ON) - channel mute OFF <input checked="" type="radio"/> (blinking) - ISOLATE active, channel mute ON
MUTE channel '1' to channel '16'	Push button - toggles the mute state of the particular audio channel. Press to mute / unmute the channel.

Mute-Properties

- Mutes are stored separately with each input bank, i. e. there are 64 independent mutes.
- Only channels from the selected bank can be mixed to the monitor bus.
- Muted channels are stored in the background when 'ISOLATE' is activated - see „Isolate“ on page 22.
- Mutes are stored in the device and mute selection is resumed after power cycle.

Isolate

For a quick individual check of the 16 audio channels the 'ISOLATE' function mutes all signals from the mix (all 'MUTE' leds are blinking). Pressing the <MUTE> push button of a single channel re-enables its signal to the mix ('soloing').



ISOLATE	LED (red) - indicates the state of the 'ISOLATE' function. <input type="radio"/> (OFF) - ISOLATE inactive <input checked="" type="radio"/> (ON) - ISOLATE active
ISOLATE	Push button - toggles 'ISOLATE' function between ON and OFF. Press to activate / deactivate ISOLATE.

Isolate Properties

- Deactivating 'ISOLATE' resumes to the previously activated mute settings.
- Isolates are not stored in the background;
i.e. all channels are muted initially when 'ISOLATE' is activated.



NOTE!

If 'ISOLATE' is active when the device is switched off, the 'ISOLATE' function is resumed and its selection is preserved after switch on.



WARNING!

Toggling <MUTE> or <ISOLATE> may result in abrupt changes of loudness.

Speaker Off

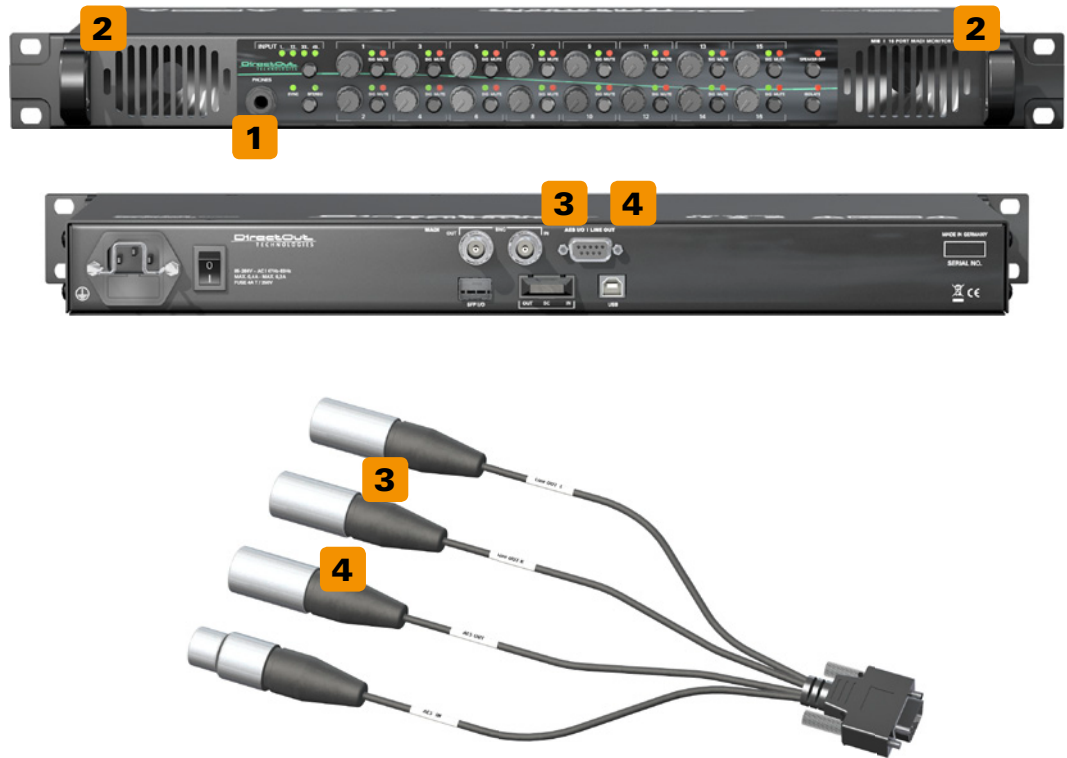
The mix signal is sent in parallel to speakers, headphones, line out and the AES out. 'SPEAKER OFF' mutes the signal output to the speakers. The other outputs remain unaffected from this switch.



SPEAKER OFF	LED (red) - indicates the mute state of the speaker output. <div><input type="radio"/> (OFF) - Speaker output not muted</div> <div><input checked="" type="radio"/> (ON) - Speaker output muted</div>
SPEAKER OFF	Push button - toggles mute state of the speaker output. Press to mute / unmute the speaker output.

Monitoring

The mix signal is sent to all four output sinks at the same time. There is no volume control for the mix master. Use 'MUTE' or the 'ISOLATE' function to mute signal output.



1 Phones	6.3 mm TRS jack, stereo Connect the headphones here to monitor the main mix.
2 Speakers	2 x speakers for monitoring of the main mix
3 Line Out	2 x XLR connector (female) Requires connected DSUB-9 adaptor at the rear panel.
4 AES Out	1 x XLR connector (female) Requires connected DSUB-9 adaptor at the rear panel.

Signal Input / Output



1 BNC OUT / IN	2 x BNC socket (coaxial) OUT: MAD I output (64 ch), connect for MAD I output signal here. IN: MAD I input (64 ch), connect MAD I input signal here.
2 SFP	1 x SFP cage* Insert SFP module here and connect MAD I input/output
3 SC OUT / IN	2 x SC socket (optical) OUT: MAD I output (64 ch), connect for MAD I output signal here. IN: MAD I input (64 ch), connect MAD I input signal here.
4 AES I/O LINE OUT	1 x DSUB-9 connector (female) Connect DSUB-9 adaptor here for XLR connection of AES I/O and Line Out.

* empty cage, module not included in delivery
All MAD I outputs carry the signal of the selected MAD I input.

Power Fail Through (PFT)

The coaxial I/O maintains the signal transmission from BNC input to BNC output in case of a power loss.

WARNING!



Only use the original adaptor or observe correct pin assignment- see “Appendix A: Wiring AES I/O, Line Out” on page 30.

Servicing



An integral USB port is used for firmware updates.

USB

USB 2.0 socket (Type B)

Connect here for firmware updates.

CHAPTER 5: Troubleshooting and Maintenance

Troubleshooting

To identify a possible defect with the device please consult the following table.

If the fault cannot be resolved using these instructions, please contact your local DirectOut representative or visit support.directout.eu.

Issue	Possible reason	Solution
Device doesn't work.	Power supply is broken.	Check that the power supply switch is on, that the device is connected to the power supply and that the socket is working. Defective fuses must be exchanged by qualified service personal only.
Optical port does not work.	Optic is dirty.	Use an air supply to carefully remove any dust. Never use objects for cleaning.
No signal at the output port.	Connections (input / output) are mixed up.	Check the connections and change the cables if necessary. Check the routing matrix.
No signal at the output port.	Signal cable defective.	Exchange the signal cable.
MADI signal at the input is not stable.	Signal source is defective or bad signal condition (Jitter > 1 ns)- e.g. due to exceeded length or bad screening attenuation of signal cable.	Change the source or use appropriate cables.
Clicks in the audio signal.	Input source is not in sync with clock master of the box.	Check the status of input LED and check clock setting of the connected device.

Maintenance

To clean the device, use a soft, dry cloth. To protect the surface, avoid using cleaning agents.

NOTE!

The device should be disconnected from the power supply during the cleaning process.



CHAPTER 6: Technical Data

Dimensions

- Width 19" (483 mm)
- Height 1 RU (44.5 mm)
- Depth 7.8" (200 mm)
- Weight about 2 kg

Power Consumption

- 10 W (typical)

Power Supply

- 84 V- 264 V AC / 47 Hz- 63 Hz / Safety class 1

Fuses

- Fuse 250 V- 2 A (slow-blow) – 2 fuses per power supply

Environmental Conditions

- Operating temperature +5°C up to +45°C
- Relative humidity: 10%- 80%, non condensing

MADI Port SC optical

- 1 x SC socket FDDI (input / output)
- ISO/IEC 9314-3
- Wave length 1310 nm
- Multi-Mode 62.5/125 or 50/125

MADI Port BNC coaxial

- 2 x BNC socket (input / output)
- Impedance: 75 Ω
- 0.3 V up to 0.6 V (peak to peak)
- power fail through technology

MADI Port SFP

- 1 x SFP (empty cage without module)

Sample Rate

- 30- 50 kHz @1 FS
- 60- 100 kHz @2 FS

MADI Format (I/O)

- 48k Frame, 96k Frame
- 56 channel, 64 channel

AES3 I/O

- 1 x DSUB-9 (adaptor to XLR not included in delivery)

Line Output

- 1 x DSUB-9 (adaptor to XLR not included in delivery)
- balanced output
- Level: +24 dBu
- SNR: -114.5 dB / -117.3 dBA
- THD+N: -105.5 dB
- THD: -108 dB

Phones

- 1 x TRS jack 6.3 mm (stereo)
- Level: +18 dBu
- SNR: -114.2 dB / -117.1 dBA
- THD+N: -103 dB
- THD: -106 dB

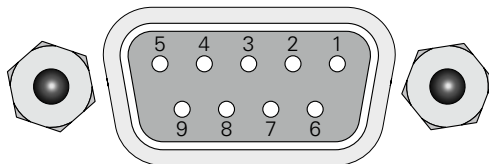
Speakers

- Class-D power amplifier
- 2 speakers 2 W / 4 W (rated / max.)
- mean SPL 81 dB (1 W / 1 m)

USB

- 1 x USB socket (Type B)
- for firmware updates

Appendix A: Wiring AES I/O, Line Out DSUB-9 (female)



Pin	Signal
1	AES RX +
2	AES TX+
3	GND
4	Line Out L-
5	Line Out R-
6	AES RX-
7	AES TX-
8	Line Out L+
9	Line Out R+



NOTE!

The pinout does not comply with the adaptor delivered with MA2CHBOX.XT.

Index

A

Accessory 12

C

Clocking 19

Conditions of Warranty see Warranty

Conformity & Certificates

CE 11

RoHS 11

WEEE 11

Contact 11

Contents 12

Conventions 5

D

Defective Parts/Modules 8

Dimensions 28

DSUB-9

Adaptor 15

E

Environmental Conditions 14, 28

F

Feature Summary 6

Firmware 16

First Aid 9

Fuses 28

I

Input Selection 19

Intended Operation 10

K

Key Lock 20

L

Lock see Key Lock

P

PFT see Power Fail Through

Power Fail Through 25

S

SFP Modules 13

Support 27

T

Troubleshooting 27

U

Updates 10

W

Warranty 10

WEEE See Conformity & Certificates: WEEE

DirectOut GmbH

Leipziger Strasse 32
09648 Mittweida
Germany

T: +49-3727-99697-50
F: +49-3727-99697-52
www.directout.eu